

UNIT REPORT

Civil Engineering (BSCE) - Reviewer's Report - Academic Data

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Civil Engineering (BSCE)

BSCE Civil Engineering Mission

Mission:

The Department of Civil and Coastal Engineering Mission Statement is as follows: The mission of the Department of Civil and Coastal Engineering is to deliver undergraduate and graduate degree programs that prepare Civil and Coastal engineers for successful careers in an increasingly global and interdisciplinary world, and to perform research that results in leading scientific contributions that have a direct impact on our ability to renew, secure, and broaden the capabilities of our nation's infrastructure, environment and homeland security. As a service-oriented profession, the Civil Engineering mission statement above is completely consistent with the core elements of the University of Florida Mission Statement: "The University of Florida is a comprehensive learning institution built on a land grant foundation. We are The Gator Nation, a diverse community dedicated to excellence in education and research and shaping a better future for Florida, the nation and the world. Our mission is to enable our students to lead and influence the next generation and beyond for economic, cultural and societal benefit." The Civil Engineering Program Educational Objectives are consistent with and support the UF Mission. Consistent with the University's land grant foundation, Civil Engineering is a public service profession perhaps more than any other engineering discipline. In order to provide benefits to society, Civil Engineers must be stewards of the public trust and be master designers and builders. As such, graduates of our program must embark on the path to professional licensure and be life-long learners who possess the capacity to pursue graduate education and the ability to stay current with the standards and requirements of the Civil Engineering profession. The program mission is also aligned with the mission statement of the College of Engineering in the three major areas of teaching research and service: The College of Engineering fosters and provides world-class programs in engineering education, research and service to enhance the economic and social well-being of the citizens of Florida, the nation and the world. Graduates of the College of Engineering at the University of Florida will exhibit the following in pursuit of their profession: Vision, as evidenced by an ability to use creative approaches to problems. Values, as evidenced by an understanding of the importance of employing strong professional ethics. Leadership, as evidenced by serving as a team/project leader with solid project management and planning skills, a mentor to less experienced staff, and a volunteer in the community. Professional expertise, as evidenced by making meaningful contributions to technical engineering problem solving as both an individual contributor and in team situations, continually enhancing both technical and non-technical skills, applying professional expertise to increasingly complex problems/projects, and increasingly capable communications skills, both verbal and written. Knowledge about the interaction of financial, societal, legal or cultural influences with science and technology.

Start: 07/01/2017

End: 06/30/2018

PG 1 Graduate highly skilled Civil Engineers

Goal: Graduate highly skilled Civil Engineers who compete favorably with graduates of other civil engineering programs

Evaluation Method:

Performance of UF Civil Engineering seniors on NCEES Fundamentals of Engineering Exam in comparison with all other examinees nationwide.

Results:

In Fall 2017, 69% of UF CE students passed the FE Exam, compared to 68% nationally. In Spring 2018, 71% of UF CE students passed the FE Exam, compared to 70% nationally.

Fundamentals of Engineering (FE) Exam Summary

Exam Date	UF CE Students			National Results		
	Number Taking	Number Passing	Pass Rate (%)	Number Taking	Number Passing	Pass Rate (%)
Spring 2018	68	48	71	5855	4086	70
Fall 2017	61	42	69	3187	2182	68
Spring 2017	76	62	82	6085	4182	69
Fall 2016	36	30	83	3390	2214	65
Spring 2016	44	30	68	5409	3819	71
Fall 2015	37	27	73	3250	2117	65
Spring 2015	44	35	80	4377	3084	70
Fall 2014	33	31	94	2499	1760	70
	399	305	76	34052	23444	69

XOn Campus: true

XProgram CIP: 14.0801

XOnline: false

XOther Site: false

XIf Other Site:

PG 2 Engage in engineering design

Goal: Produce graduates who successfully engage in engineering design and obtain their Professional Engineering (P.E.) licenses.

Evaluation Method:

Comparison of UF CE graduates pass rate on NCEES Professional Engineer (P.E.) Examination for Engineering licensure with the average pass rate of examinees nationwide. Also based on Employer Survey results from semester in response to question asking assessment of graduates' ability to demonstrate competence in engineering design.

Results:

In Fall 2017, UF Grads passed the PE Exam at 78%, compared with a national average of 69%. In Spring 2018, UF Grads passed the PE Exam at 78%, compared with a national average of 65%. Additionally, employers ranked UF CE graduates 4.88/5.00 at "demonstrate competence in engineering design" in Spring 2018 Employer Survey.

Professional Engineering (P.E.) Exam Summary

UF CE Students

National Results

Exam Date	Number Taking	Number Passing	Pass Rate (%)	Number Taking	Number Passing	Pass Rate (%)
Spring 2018	65	51	78	4859	3147	65
Fall 2017	60	47	78	4453	3056	69
Spring 2017	63	54	86	4922	3370	68
Fall 2016	63	50	79	4047	2765	68
Spring 2016	50	42	84	3701	2546	69
Fall 2015	55	47	85	3214	2150	67
Spring 2015	48	39	81	3463	2341	68
Fall 2014	47	43	91	2924	2026	69
Spring 2014	47	40	85	3057	2212	72
Fall 2013	44	35	80	3574	1971	55
Spring 2013	46	39	85	3854	2412	63
Fall 2012	70	47	67	4276	2265	53
Spring 2012	50	39	78	4690	2714	58
Grand Total	708	573	81	51034	32975	65

XOn Campus: true

XProgram CIP: 14.0801

XOnline: false

XOther Site: false

XIf Other Site:

PG 3 Professional responsibility

Goal: Produce graduates with an understanding of professional responsibility who participate in professional and other volunteer organizations

Evaluation Method:

Track the percentage of Civil Engineering students participating in the American Society of Civil Engineers (ASCE) student chapter via our required senior exit survey. We expect that the majority of students will be involved in the organization. Also use Employer Survey response to rate CE graduates in "Advance to positions of increasing responsibility in your company."

Results:

Senior exit survey data indicate that 60% of CE students graduating in Fall 2017 participated in ASCE and 69% of CE students of those graduating in Spring 2018 participated in ASCE.

Employer Survey in Spring 2018 rated CE graduates at 4.75/5.00 at "Advance to positions of increasing responsibility in your company."

XOn Campus: true

XProgram CIP: 14.0801

XOnline: false

XOther Site: false

XIf Other Site:

SLO 1 Content Knowledge

Outcome: Conduct civil engineering experiments, analyze and interpret data.

SLO Area (select one): Content (UG)

Assessment Method:

Lab reports; Exit Survey; Employer Survey

Lab reports: faculty developed rubric (see example in Appendix A); Surveys: Direct Likert scale self-assessment.

SLO Not Assessed This Year: false

Results:

Results

Senior survey, employer survey and all course assessments showed mean Likert scores over 3.00 (in all cases over 3.50), with all measures indicating at least 75% of students in the Likert 3,4,5 range. Students equaled or exceeded the national mean in 4 out of 6 FE Exam scaled subscores relevant to math/science/engineering knowledge in Fall 2017, and in 6 out of 6 subscores in Spring 2018.

SLO #1: Apply knowledge of mathematics, science and engineering principles to civil engineering problems

Assessment	F 2015	S 2016	F 2016	S 2017	F 2017	S 2018
FE Subject Exam Differential						
Mathematics	+0.03	-0.04	+0.29	+0.04	-0.18	+0.15
Probability & Statistics	-0.15	-0.06	+0.03	0.00	-0.12	+0.06
Statics	-0.25	-0.04	+0.36	+0.11	+0.19	+0.35
Dynamics	+0.34	+0.06	+0.17	+0.03	0.00	+0.12
Mechanics of Materials	+0.05	0.00	+0.43	+0.09	+0.05	+0.24
Fluid Mechanics	+0.27	+0.06	-0.03	+0.34	+0.17	+0.14

	F 2015	S 2016	F 2016	S 2017	F 2017	S 2018

Assessment	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5
Student Self-Assessment from Exit Survey	4.67 100%	4.62 100%	4.71 100%	4.70 100%	4.63 98%	4.69 100%
Employer Survey		4.38 100%				4.56 100%
CWR 3201 (Final Exam Question)	3.92 90%	3.76 88%	3.90 90%	3.34 75%	3.59 76%	3.51 78%
CES 3102 (Final Quiz)	4.34 92%	4.22 91%	4.59 98%	4.33 96%	4.33 96%	4.00 88%

Summary of Assessment Results for SLO #1 by Semester

Senior Exit Survey Outcomes Data:

Student Learning Outcomes	Semester							
	Fall 2016		Spring 2017		Fall 2017		Spring 2018	
	Mean	% 3,4,5	Mean	% 3,4,5	Mean	% 3,4,5	Mean	% 3,4,5
SLO #1: Apply knowledge of mathematics, science, and engineering	4.71	100	4.70	100	4.63	98	4.69	100
SLO #2: Design and conduct experiments, analyze and interpret data	4.31	98	4.35	100	4.33	100	4.21	94
SLO #3: Design systems and components to meet desired needs	4.17	93	4.21	98	4.16	98	4.07	100
SLO #4: Communicate technical data and design information effectively in writing and in speech	4.21	95	4.53	100	4.30	96	4.50	100
Sample Size	42		66		57		52	

Start: 07/01/2017

End: 06/30/2018

Threshold of Acceptability: 75

How many students did you assess for this outcome?: 52

How many students met the outcome?: 52

What percentage of students met the outcome?: 100

Does this meet your threshold of acceptability?: Yes

SLO 2 Content Knowledge

Outcome: Conduct civil engineering experiments, analyze and interpret data.

SLO Area (select one): Content (UG)

Assessment Method:

Lab reports; Exit Survey; Employer Survey

Lab reports: faculty developed rubric (see example in Appendix A); Surveys: Direct Likert scale self-assessment.

SLO Not Assessed This Year: false

Results:

Senior survey, Employer Survey and coursework assessments all exceed a mean Likert score of 3.70 with at least 75% in the 3,4,5 range. The percentage of students scoring 3,4,5 was found to be over 75% in all cases. The FE Exam scaled subscores for Probability & Statistics in Fall 2017 did not exceed the national average but exceeded the national average in Spring 2018.

SLO #2: Conduct civil engineering experiments, analyze and interpret data

Assessment	F 2015	S 2016	F 2016	S 2017	F 2017	S 2018
FE Subject Exam Differential						
Probability & Statistics	-0.15	-0.06	+0.03	0.00	-0.12	+0.06

	F 2015	S 2016	F 2016	S 2017	F 2017	S 2018

Assessment	Mean	Mean	Mean	Mean	Mean	Mean
	Score /	Score /	Score /	Score /	Score /	Score /
	% 3,4,5	% 3,4,5	% 3,4,5	% 3,4,5	% 3,4,5	% 3,4,5
Student Self-Assessment from Senior Exit Survey	4.30 97%	4.02 93%	4.31 98%	4.35 100%	4.33 100%	4.21 94%
Employer Survey		4.38 100%				4.13 100%
CWR 3201 (Final Exam Question)	4.47 98%	4.46 97%	3.87 84%	3.89 78%	3.83 83%	4.09 91%
CWR 3201 (Lab Report: Drag)	4.00 86%	4.22 94%	4.19 92%	4.28 89%	4.06 86%	4.33 96%
CEG 4011 (Lab Report)	4.05 88%	4.48 97%	4.56 100%	4.29 92%		3.74 84%

Start: 07/01/2017

End: 06/30/2018

Threshold of Acceptability: 75

How many students did you assess for this outcome?: 52

How many students met the outcome?: 52

What percentage of students met the outcome?: 100

Does this meet your threshold of acceptability?: Yes

SLO 3 Critical Thinking

Outcome:

Design a civil engineering system, component or process to meet desired needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints.

SLO Area (select one): Critical Thinking (UG)

Assessment Method:

Design projects; FE Exam; Exit Survey; Employer Survey

Exam question: faculty developed rubric; FE Exam: compare with National pass rates. Surveys: Direct Likert scale self-assessment.

SLO Not Assessed This Year: false

Results:

Results

The FE Exam subscores for Structural Design for AY 2017-2018 were slightly below the national average in Fall 2017 but exceeded the national average in Spring 2018. Senior survey, employer survey and coursework results showed mean Likert scores in excess of 3.60 and % of students attaining 3,4, or 5 exceeded 90% in all cases.

SLO #3: Design a civil engineering system, component or process to meet desired needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints

Assessment	F 2015	S 2016	F 2016	S 2017	F 2017	S 2018
FE Subject Exam Differential						
Structural Design	+0.20	-0.08	0.00	-0.08	-0.04	+0.12
Assessment	F 2015	S 2016	F 2016	S 2017	F 2017	S 2018
	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5
Student Self-Assessment from Senior Exit Survey	4.37 97%	4.02 93%	4.17 93%	4.21 98%	4.16 98%	4.07 100%
Employer Survey		4.13 100%				4.33 100%

CGN 4806 (Final Design Project)	3.74 100%	4.00 100%	3.75 100%	3.35 96%	4.22 100%	4.70 100%
CGN 4910 (Final Design Project)		4.30 100%	4.16 100%	3.90 100%	3.95 100%	3.69 96%

Start: 07/01/2017

End: 06/30/2018

Threshold of Acceptability: 75

How many students did you assess for this outcome?: 52

How many students met the outcome?: 52

What percentage of students met the outcome?: 100

Does this meet your threshold of acceptability?: Yes

SLO 4 Communication

Outcome: Communicate technical data and design information effectively in writing and in speech to other civil engineers.

SLO Area (select one): Communication (UG)

Assessment Method:

Lab report; Design project presentation; Exit Survey; Employer Survey

Lab report: faculty developed rubric; Design project presentation: faculty developed rubric; Surveys: Direct Likert scale self-assessment.

SLO Not Assessed This Year: false

Results:

Employer Survey, Senior survey and coursework results all show mean Likert Scores at 4.00 and above in both Fall 2017 and Spring 2018, with at least 90% of students scoring in the 3,4,5 range. The FE Exam subscores could not be used to assess this outcome.

SLO #4: Communicate technical data and design information effectively in writing and in speech

	F 2015	S 2016	F 2016	S 2017	F 2017	S 2018
Assessment	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5	Mean Score / % 3,4,5
Student Self-Assessment from Senior Exit Survey	4.70 100%	4.18 98%	4.21 95%	4.53 100%	4.30 96%	4.50 100%
Employer Survey		4.13 100%				4.06 100%
ENC 3246 (Writing Assignment)	3.95 91%	4.17 96%	4.30 100%	4.14 96%	4.37 93% ¹	
CWR 3201 (Lab Report)	4.82 100%	4.72 100%	4.88 100%	4.79 97%	4.70 95%	4.71 96%
CEG 4011 (Lab Report)	4.05 88%	4.48 97%	4.56 100%	3.91 87%		4.29 97%

¹Data for ENC 3246 were combined for Fall 2017 and Spring 2018 by the Writing Program.

Start: 07/01/2017

End: 06/30/2018

Threshold of Acceptability: 75

How many students did you assess for this outcome?: 52

How many students met the outcome?: 52

What percentage of students met the outcome?: 100

Does this meet your threshold of acceptability?: Yes

Programmatic Use of Results

Program: Civil Engineering (BSCE)

Programmatic Use of Results:

Results were reviewed at the end of each semester by the undergraduate coordinator and the departmental administration, and then again at the departmental curriculum committee meeting in September 2018. It was determined that all Student Learning Outcomes had been achieved and that the Program Goals were all attained. It was noted that undergraduate performance on the FE Exam continued to exceed national means but still did not do so by as great a margin as in previous years. There were also desires to expand the latest curriculum change adding more computer programming capability to also include comprehensive coverage of smart sensors and data analytics, areas which have become increasingly important in the civil engineering field. Accordingly the following changes were implemented/proposed:

- 1) The faculty approved a change to require a grade of C or better to pass the five core classes in the five respective specialty areas in civil engineering, namely CGN 4160 (Civil Engineering Practice), CEG 4011 (Soil Mechanics), CES (Mechanics of Engineering Structures), CWR 3201 (Hydrodynamics), and TTE 4004C (Transportation Engineering). This will require the students to attain a stronger fundamental knowledge base for all further advanced topics in the field.

- 2) The expanded slate of departmentally-offered FE Review sessions was to be continued for AY 2018-2019 along with the departmentally-provided stipends for the review instructors. Civil engineering undergraduate students continued to exceed the national averages on the FE Exam, however the improvement in their performance over the past two years has been only minimal. The performance on the exams will be monitored this year to assess the effectiveness of these measures.

- 3) The department will launch a steering committee consisting of the current instructors of our computer methods and our instrumentation course along with a newly arrived faculty member from computer science and a faculty member with research interests in smart structures. This committee will investigate ways to reorganize our three-course sequence in computation and instrumentation to introduce current topics such as smart sensors and data analytics.

- 4) In parallel with the previous initiative, the faculty also approved the addition of a Building Information Modelling (BIM) class be included as a software course option in addition to the currently available Geographic Information Systems (GIS) software courses.

Program Results Not Reported This Year:

BSCE Civil Engineering Detail

End: 06/30/2018

Start: 07/01/2017

Providing Department: Civil Engineering (BSCE)

Assessment Cycle (All AAPs):

The SLOs in Civil Engineering represent a subset of 11 SLOs used in connection with Engineering Accreditation as required through the Accreditation Board for Engineering and Technology (ABET). The ABET accreditation cycle is 6-years, but the assessments are carried out every year, so the same assessment frequency is used for the assessment methods outlined in Figure 2. In accordance with the review of assessment data for ABET, the analysis and interpretation period is set for early summer, with improvement actions and implementation slated for the Fall semester in time for each new Undergraduate Catalog cycle.

Analysis and Interpretation: May - June

Improvement Actions: Completed by October 1

Dissemination: Completed by December 1

Year	17-18	18-19	19-20	20-21	21-22	22-23
SLOs						
Content Knowledge						
#1	x	x	x	x	x	X
#2	x	x	x	x	x	x
Critical Thinking						
#3	x	x	x	x	x	x
Communication						
#4	x	x	x	x	x	x

SLO Assessment Rubric (All AAPs):

Assessment rubrics vary markedly across the different SLO's and even within the multiple direct and indirect assessment measures used for any given SLO. In general, direct assessments from class exams/quizzes/projects/presentations are converted to a 1-5 Likert scale, with the expectation that the mean score will exceed 3.0 and more than 75% of the students assessed will earn Likert scores of 3,4, or 5. The same metric is applied to indirect assessments conducted via surveys (employer survey, senior exit survey). The Fundamentals of Engineering (FE) Examination is an independent third-party direct assessment for several SLOs; the expectation is that the pass rate of UF Civil Engineering students will exceed the national average.

Methods and Procedures (UG and Certificate AAPs):

The four SLOs are assessed through the following direct and indirect methods:

Direct Methods:

1. Coursework-based assessment in Civil Engineering courses (previously outlined):
2. Fundamentals of Engineering (FE) Examination

The Fundamentals of Engineering Examination provides an objective third-party assessment which is nationally-normed. Almost all students in our program take the F.E. exam, so the sampling rate for our students approaches 100%. The FE exam cannot be used to assess all four of the SLOs; the rubric for assignment of FE exam results to the various SLOs is shown below:

SLO #1: Overall result; A.M. exam questions in: Mathematics, Probability & Statistics, Chemistry, Electricity & Magnetism, Statics, Dynamics, Mechanics of Materials, Fluid Mechanics, Thermodynamics; P.M. exam questions in Transportation, Water Resources, Geotechnical, Construction, and Materials.

SLO #2: N/A

SLO #3: P.M. Exam questions in Structural Design

SLO #4: N/A

Indirect Methods:

1. Senior Exit Survey: Student self-assessment of achievement of SLOs; performed each semester by graduating seniors.

Another assessment tool that we have found very useful is the Senior Exit Survey, which is administered online to our students in their final semester. The survey is a graduation requirement, so we are able to achieve survey rates of 100%. The students are asked to self-assess their achievement of the outcomes on a 1-5 scale as they complete their UF careers.

2. Employer Survey: Evaluation of performance of recent Civil Engineering graduates by employers; performed every 2 years (even years).

Our Employer Survey, which is administered every 2 years, also provides a quantitative third-party assessment of the abilities of our students. The employer survey asks the employers directly the rate the student achievement of the SLOs on a 1-5 Likert Scale.

These are summarized in the matrix below:

SLO Assessment Matrix

2013-14 Student Learning Outcome	Assessment Method	Measurement Procedure
#1: Apply knowledge of mathematics, science and engineering principles to civil engineering problems.	Course exam questions; FE Exam; Exit Survey; Employer Survey	Exam question: faculty developed rubric (see example in Appendix A); FE Exam: compare with National pass rates. Surveys: Direct Likert scale self-assessment.
#2: Conduct civil engineering experiments, analyze and interpret data.	Lab reports; Exit Survey; Employer Survey	Lab reports: faculty developed rubric (see example in Appendix A); Surveys: Direct Likert scale self-assessment.
#3: Design a civil engineering system, component or process to meet desired needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints.	Design projects; FE Exam; Exit Survey; Employer Survey	Exam question: faculty developed rubric; FE Exam: compare with National pass rates. Surveys: Direct Likert scale self-assessment.
#4: Communicate technical data and design information effectively in writing and in speech to other civil engineers.	Lab report; Design project presentation; Exit Survey; Employer Survey	Lab report: faculty developed rubric; Design project presentation: faculty developed rubric; Surveys: Direct Likert scale self-assessment.

Assessment Method	Administered By	When Administered
Direct Assessments		
Student Performance in Courses	Civil Engineering Faculty	Every semester
Student Performance on FE Exam	NCEES	Semi-Annually (April, October)
Indirect Assessments		
Senior Exit Survey	Department (Self-Assessment)	Every semester
Employer Survey	Department (Civil Engineering Employers)	Every two years

Curriculum Map (UG AAPs only):

Key: Introuced Reinforced Assessed

Courses	EGM2511	EGM3520	ENC3254	PHY2048L	CGN3501C	CES3102	CES4702	CEG4011	CWR3201	CGN4806	CGN4910	FE Exam	Exit Survey	Employer Survey (even years only)
SLOs														
Content Knowledge														
#1	I	R			R	A Exam Question	A Exam Question					A	A	A
#2				I	R			A Lab Report	A Lab Report				A	A
Critical Thinking														
#3	I	R				R	A Design Problem			A Design Project	A Design Project	A	A	A
Communication														
#4			I		R				A Lab Report	A Design Presentation	A Design Presentation		A	A